



DISCRETE POWER DIODES and THYRISTORS
DATA BOOK



ST300C..C SERIES

PHASE CONTROL THYRISTORS

Hockey Puk Version

Features

- Center amplifying gate
- Metal case with ceramic insulator
- International standard case TO-200AB (E-PUK)

Typical Applications

- DC motor controls
- Controlled DC power supplies
- AC controllers

Major Ratings and Characteristics

| Parameters | ST300C..C | Units |
|-------------------|-------------|-------------------|
| $I_{T(AV)}$ | 650 | A |
| @ T_{hs} | 55 | °C |
| $I_{T(RMS)}$ | 1290 | A |
| @ T_{hs} | 25 | °C |
| I_{TSM} | 8000 | A |
| @ 50Hz | 8380 | A |
| I^2t | 320 | KA ² s |
| @ 60Hz | 292 | KA ² s |
| V_{DRM}/V_{RRM} | 400 to 2000 | V |
| t_q typical | 100 | μs |
| T_J | - 40 to 125 | °C |

650A



case style TO-200AB (E-PUK)

ST300C..C Series

ELECTRICAL SPECIFICATIONS

Voltage Ratings

| Type number | Voltage Code | V_{DRM}/V_{RRM} , max. repetitive peak and off-state voltage V | V_{RSM} , maximum non-repetitive peak voltage V | I_{DRM}/I_{RRM} max. @ $T_J = T_{J \text{ max}}$ mA |
|-------------|--------------|--|---|---|
| ST300C..C | 04 | 400 | 500 | 50 |
| | 08 | 800 | 900 | |
| | 12 | 1200 | 1300 | |
| | 16 | 1600 | 1700 | |
| | 18 | 1800 | 1900 | |
| | 20 | 2000 | 2100 | |

On-state Conduction

| Parameter | ST300C..C | Units | Conditions |
|--|-----------|--------------------|---|
| $I_{T(AV)}$ Max. average on-state current @ Heatsink temperature | 650 (320) | A | 180° conduction, half sine wave |
| | 55 (75) | °C | double side (single side) cooled |
| $I_{T(RMS)}$ Max. RMS on-state current | 1290 | A | DC @ 25°C heatsink temperature double side cooled |
| I_{TSM} Max. peak, one-cycle non-repetitive surge current | 8000 | | $t = 10\text{ms}$ No voltage reapplied |
| | 8380 | | $t = 8.3\text{ms}$ |
| | 6730 | | $t = 10\text{ms}$ 100% V_{RRM} reapplied |
| | 7040 | | $t = 8.3\text{ms}$ reapplied |
| I^2t Maximum I^2t for fusing | 320 | KA ² s | $t = 10\text{ms}$ No voltage reapplied |
| | 292 | | $t = 8.3\text{ms}$ reapplied |
| | 226 | | $t = 10\text{ms}$ 100% V_{RRM} reapplied |
| | 207 | | $t = 8.3\text{ms}$ reapplied |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 3200 | KA ² √s | $t = 0.1$ to 10ms , no voltage reapplied |
| $V_{T(TO)1}$ Low level value of threshold voltage | 0.97 | V | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_{J \text{ max}}$. |
| $V_{T(TO)2}$ High level value of threshold voltage | 0.98 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_{J \text{ max}}$. |
| r_{t1} Low level value of on-state slope resistance | 0.74 | mΩ | $(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_{J \text{ max}}$. |
| r_{t2} High level value of on-state slope resistance | 0.73 | | $(I > \pi \times I_{T(AV)})$, $T_J = T_{J \text{ max}}$. |
| V_{TM} Max. on-state voltage | 2.18 | V | $I_{pk} = 1635\text{A}$, $T_J = T_{J \text{ max}}$, $t_p = 10\text{ms}$ sine pulse |
| I_H Maximum holding current | 600 | mA | $T_J = 25^\circ\text{C}$, anode supply 12V resistive load |
| I_L Typical latching current | 1000 | | |

ST300C..C Series

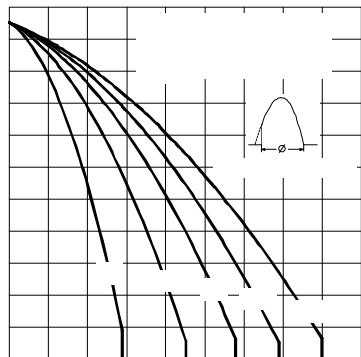


Fig. 3 - Current Ratings Characteristics

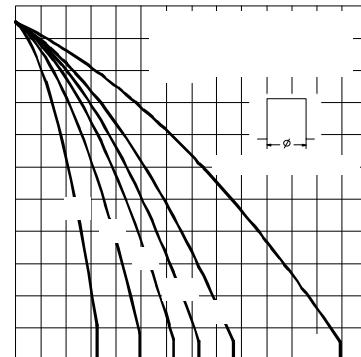


Fig. 4 - Current Ratings Characteristics

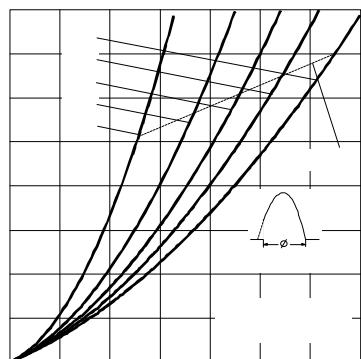


Fig. 5 - On-state Power Loss Characteristics

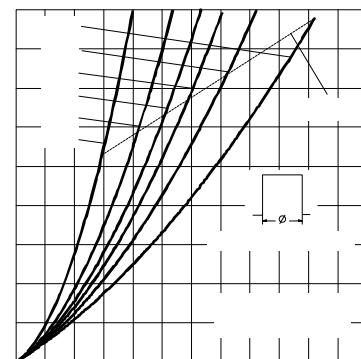


Fig. 6 - On-state Power Loss Characteristics

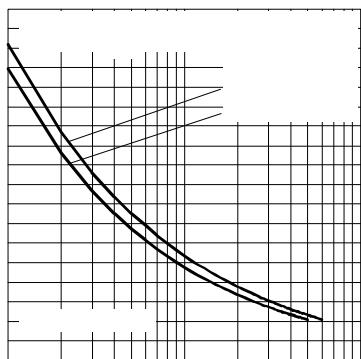


Fig. 7 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

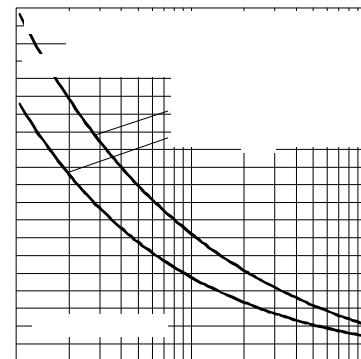


Fig. 8 - Maximum Non-Repetitive Surge Current
Single and Double Side Cooled

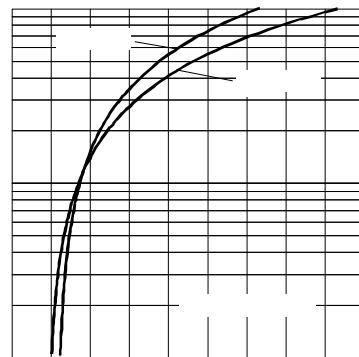


Fig. 9 - On-state Voltage Drop Characteristics

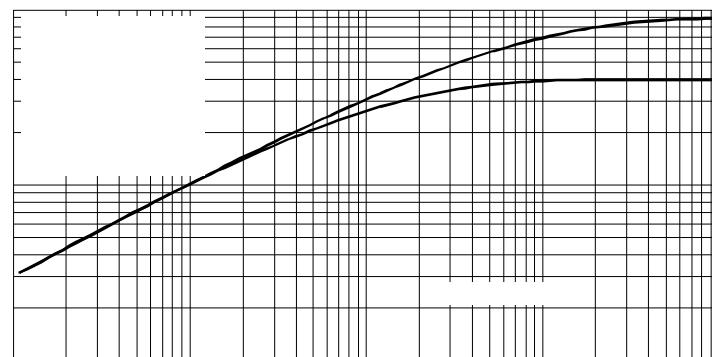


Fig. 10 - Thermal Impedance Z_{thJ-hs} Characteristics

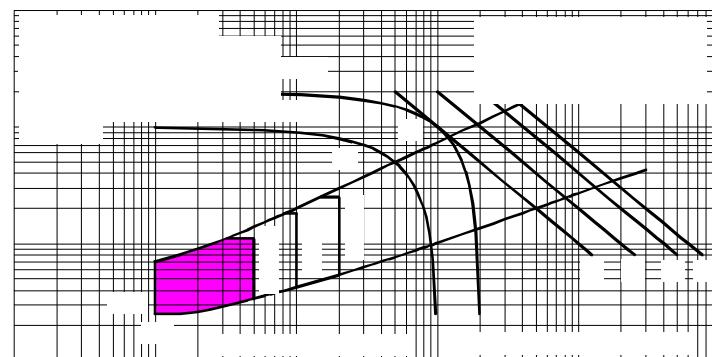


Fig. 11 - Gate Characteristics

ST300C..C Series

Switching

| Parameter | ST300C..C | Units | Conditions |
|-----------|---|-------|--|
| di/dt | Max. non-repetitive rate of rise of turned-on current | 1000 | A/μs $T_J = T_J$ max, anode voltage $\leq 80\%$ V_{DRM} |
| t_d | Typical delay time | 1.0 | μs Gate current 1A, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ C$ |
| t_q | Typical turn-off time | 100 | $I_{TM} = 300A$, $T_J = T_J$ max, $di/dt = 40A/\mu s$, $V_R = 50V$ $dv/dt = 20V/\mu s$, Gate 0V 100Ω , $t_p = 500\mu s$ |

Blocking

| Parameter | ST300C..C | Units | Conditions |
|------------------------|--|-------|--|
| dv/dt | Maximum critical rate of rise of off-state voltage | 500 | V/μs $T_J = T_J$ max, linear to 80% rated V_{DRM} |
| I_{RRM} I_{DRM} | Max. peak reverse and off-state leakage current | 50 | mA $T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied |

Triggering

| Parameter | ST300C..C | Units | Conditions |
|-------------|-------------------------------------|--------------------------|---|
| P_{GM} | Maximum peak gate power | 10.0 | |
| $P_{G(AV)}$ | Maximum average gate power | 2.0 | W $T_J = T_J$ max, $t_p \leq 5ms$ |
| I_{GM} | Max. peak positive gate current | 3.0 | A $T_J = T_J$ max, $t_p \leq 5ms$ |
| $+V_{GM}$ | Maximum peak positive gate voltage | 20 | V $T_J = T_J$ max, $t_p \leq 5ms$ |
| $-V_{GM}$ | Maximum peak negative gate voltage | 5.0 | |
| I_{GT} | DC gate current required to trigger | TYP. 200 100 50 | mA MAX. - 200 - $T_J = -40^\circ C$ $T_J = 25^\circ C$ $T_J = 125^\circ C$ |
| V_{GT} | DC gate voltage required to trigger | 2.5 1.8 1.1 | V - 3.0 - $T_J = -40^\circ C$ $T_J = 25^\circ C$ $T_J = 125^\circ C$ |
| I_{GD} | DC gate current not to trigger | 10.0 | mA $T_J = T_J$ max |
| V_{GD} | DC gate voltage not to trigger | 0.25 | V $T_J = T_J$ max |

Max. required gate trigger/ current/voltage are the lowest value which will trigger all units 12V anode-to-cathode applied

Max. gate current/voltage not to trigger is the max. value which will not trigger any unit with rated V_{DRM} anode-to-cathode applied

ST300C..C Series

Thermal and Mechanical Specification

| Parameter | ST300C..C | Units | Conditions |
|--------------|---|-------------------|---------------------------------|
| T_J | Max. operating temperature range | °C | |
| T_{stg} | Max. storage temperature range | | |
| R_{thJ-hs} | Max. thermal resistance, junction to heatsink | K/W | DC operation single side cooled |
| | | | DC operation double side cooled |
| R_{thC-hs} | Max. thermal resistance, case to heatsink | K/W | DC operation single side cooled |
| | | | DC operation double side cooled |
| F | Mounting force, $\pm 10\%$ | N (Kg) | |
| | | | |
| wt | Approximate weight | g | |
| Case style | TO-200AB (E-PUK) | See Outline Table | |

ΔR_{thJ-hs} Conduction

(The following table shows the increment of thermal resistance R_{thJ-hs} when devices operate at different conduction angles than DC)

| Conduction angle | Sinusoidal conduction | | Rectangular conduction | | Units | Conditions |
|------------------|-----------------------|-------------|------------------------|-------------|-------|----------------------------|
| | Single Side | Double Side | Single Side | Double Side | | |
| 180° | 0.010 | 0.011 | 0.007 | 0.007 | K/W | $T_J = T_{J \text{ max.}}$ |
| 120° | 0.012 | 0.012 | 0.012 | 0.013 | | |
| 90° | 0.015 | 0.015 | 0.016 | 0.017 | | |
| 60° | 0.022 | 0.022 | 0.023 | 0.023 | | |
| 30° | 0.036 | 0.036 | 0.036 | 0.037 | | |

Ordering Information Table

| Device Code | ST | 30 | 0 | C | 20 | C | 1 | |
|-------------|--|----|---|---|----|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | - Thyristor | | | | | | | |
| 2 | - Essential part number | | | | | | | |
| 3 | - 0 = Converter grade | | | | | | | |
| 4 | - C = Ceramic Puk | | | | | | | |
| 5 | - Voltage code: Code x 100 = V_{RRM} (See Voltage Rating Table) | | | | | | | |
| 6 | - C = Puk Case TO-200AB (E-PUK) | | | | | | | |
| 7 | - 0 = Eyelet terminals (Gate and Auxiliary Cathode Unsoldered Leads) | | | | | | | |
| | 1 = Fast-on terminals (Gate and Auxiliary Cathode Unsoldered Leads) | | | | | | | |
| | 2 = Eyelet terminals (Gate and Auxiliary Cathode Soldered Leads) | | | | | | | |
| | 3 = Fast-on terminals (Gate and Auxiliary Cathode Soldered Leads) | | | | | | | |
| 8 | - Critical dv/dt: None = 500V/ μ sec (Standard value) | | | | | | | |
| | L = 1000V/ μ sec (Special selection) | | | | | | | |

ST300C..C Series

Outline Table

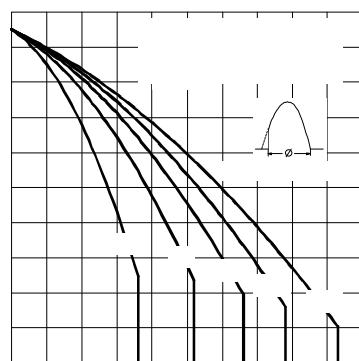
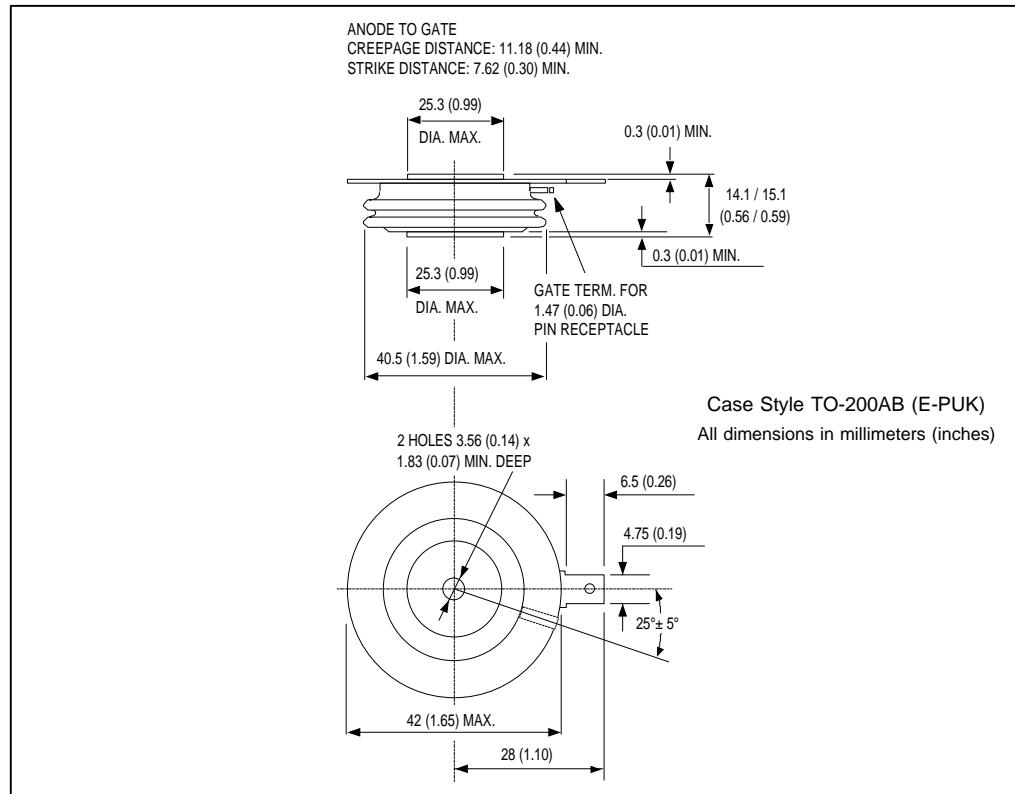


Fig. 1 - Current Ratings Characteristics

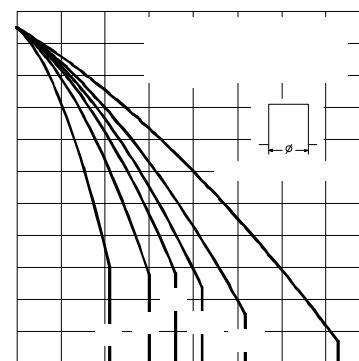


Fig. 2 - Current Ratings Characteristics